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(54) **WETTING ENHANCEMENT COATING ON INTERMEDIATE TRANSFER MEMBER (ITM) FOR AQUEOUS INKJET INTERMEDIATE TRANSFER ARCHITECTURE**

(71) Applicant: **Xerox Corporation**, Norwalk, CT (US)

(72) Inventors: **Chu-heng Liu**, Penfield, NY (US); **Anthony S. Condello**, Webster, NY (US); **Paul J. McConville**, Webster, NY (US); **Srinivas Mettu**, Webster, NY (US)

(73) Assignee: **Xerox Corporation**, Norwalk, CT (US)

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(52) **U.S. Cl.**
CPC ***B41J 2/01*** (2013.01); ***B41J 2/2107*** (2013.01); ***B41J 2/2114*** (2013.01); *B41J 2/0057* (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
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USPC 347/100, 95, 96, 99, 88, 103, 102; 106/31.13, 31.27, 31.6; 523/160, 161
See application file for complete search history.

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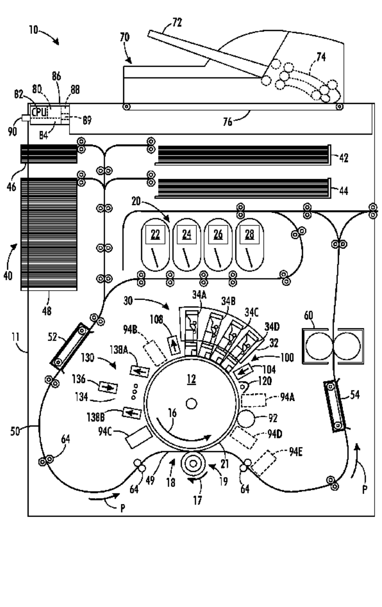
Primary Examiner — Manish S Shah
(74) *Attorney, Agent, or Firm* — Hoffman Warnick LLC

(57) **ABSTRACT**

Described herein is a method and apparatus for ink jet printing. The method includes providing a wetting enhancement coating on a transfer member. The wetting enhancement coating includes water; non-water soluble binders selected from the group consisting of acrylic polymers, styrene acrylic polymers, vinyl-acrylic polymers, vinyl acetate ethylene; and a surfactant. The wetting enhancement coating is dried to form a film having a surface energy greater than 25 mJ/m^2. Ink droplets are ejected onto the film to form an ink image on the film. The ink image is dried and the ink image and film are transferred to a recording medium.

20 Claims, 2 Drawing Sheets



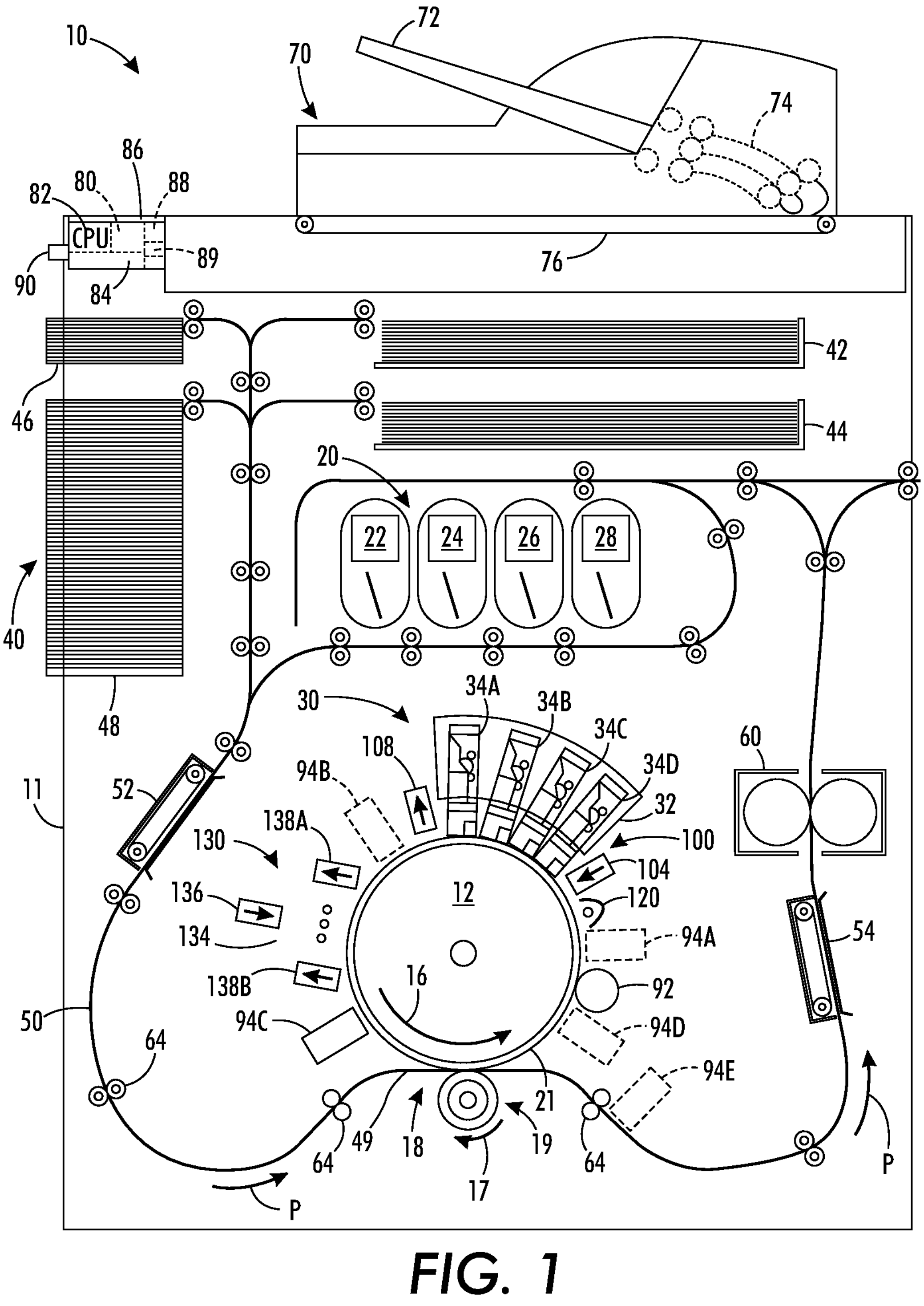

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FIG. 1

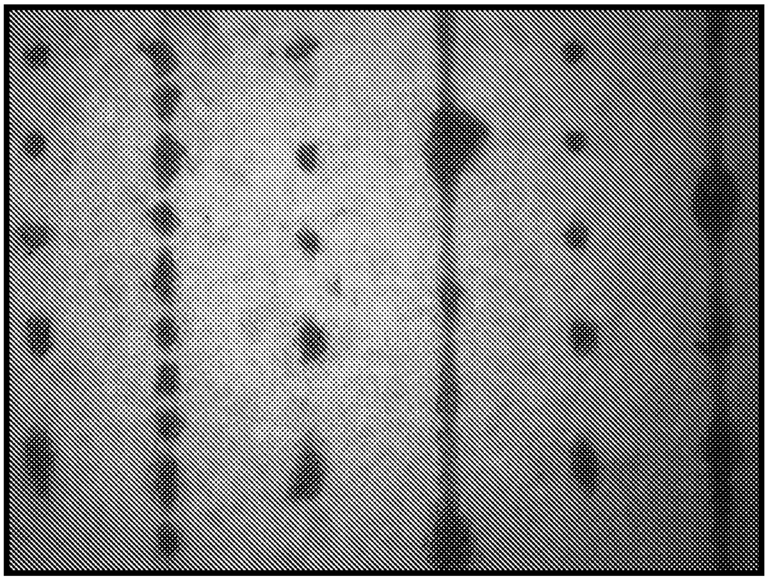

FIG. 2

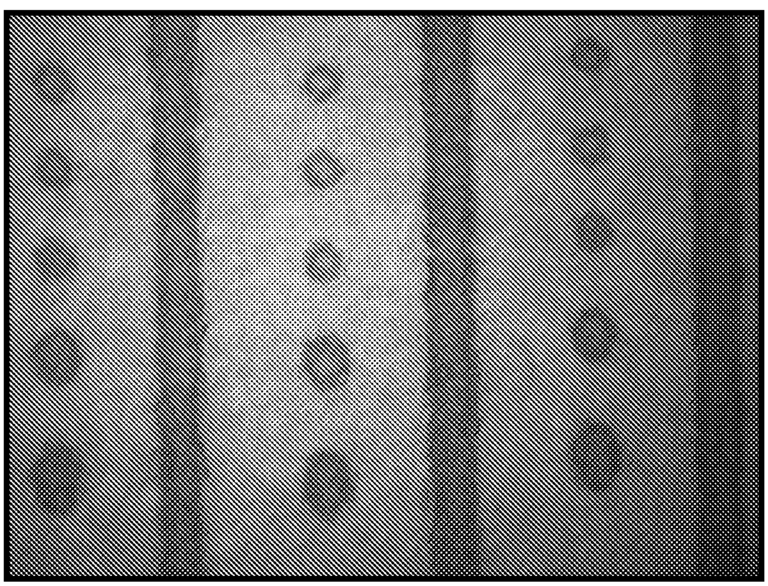

FIG. 3

WETTING ENHANCEMENT COATING ON INTERMEDIATE TRANSFER MEMBER (ITM) FOR AQUEOUS INKJET INTERMEDIATE TRANSFER ARCHITECTURE

CROSS REFERENCE TO RELATED APPLICATIONS

This application relates to commonly assigned copending application Ser. No. 13/716,889 entitled "Oxygen Plasma Treatment to Improve Wetting of Aqueous Latex Inks on Low Surface Energy Elastomeric Surfaces"; and to commonly assigned copending application Ser. No. 13/717,212 entitled "System And Method For Eliminating Background Image Data In Ink Images In An Inkjet Printer"; all filed simultaneously herewith and incorporated by reference herein in their entirety.

BACKGROUND

1. Field of Use

This disclosure is generally directed to inkjet transfix apparatuses and methods. In particular, disclosed herein is a method and composition that improves the wetting and release capability of an aqueous latex ink on low surface energy materials.

2. Background

Inkjet systems in which a liquid or melt solid ink is discharged through an ink discharge port such as a nozzle, a slit and a porous film are used in many printers due to their characteristics such as small size and low cost. In addition, an inkjet printer can print not only on paper substrates, but also on various other substrates such as textiles, rubber and the like.

During the printing process, various intermediate media (e.g., transfer belts, intermediate blankets or drums) may be used to transfer the formed image to the final substrate. In intermediate transfix processes, aqueous latex ink is inkjetted onto an intermediate blanket where the ink film is dried with heat. The dried image is subsequently transfixed on to the final paper substrate. For this process to properly operate, the intermediate blanket has to satisfy two conflicting requirements—the first requirement is that ink has to spread well on the blanket and the second requirement is that, after drying, the ink should release from the blanket. Since aqueous ink comprises a large amount of water, such ink compositions wet and spread very well on high energy (i.e., greater than 40 mJ/m^2) hydrophilic substrates. However, due to the high affinity to such substrates, the aqueous ink does not release well from these substrates. Silicone rubbers with low surface energy (i.e., about 20 mJ/m^2 or less) circumvent the release problem. However, a major drawback of the silicone rubbers is that, the ink does not wet and spread on these substrates due to low affinity to water. Thus, the ideal intermediate blanket for the transfix process would have both optimum spreading to form a good quality image and optimum release properties to transfix the image to paper. While some solutions, such as adding surfactants to the ink to reduce the surface tension of the ink, hves been proposed, these solutions present additional problems. For example, the surfactants result in uncontrolled spreading of the ink that causes the edges of single pixel lines to be undesirably wavy. Moreover, aqueous printheads have certain minimum surface tension requirements (i.e., greater than 20 mN/m) that must be met for good jetting performance.

Thus, there is a need for a way to provide the desired spreading and release properties for aqueous inks to address the above problems faced in transfix process.

SUMMARY

Disclosed herein is a method for ink jet printing. The method includes providing a wetting enhancement coating on an intermediate transfer member. The wetting enhancement coating includes water, binders and a surfactant. The wetting enhancement coating is dried to form a film having a surface energy greater than 25 mJ/m^2. Ink droplets are ejected onto the film to form an ink image on the film. The ink image is dried and the ink image and film are transferred to a recording medium.

Described herein is an ink jet printer that includes a transfer member. A wetting enhancement station adjacent the transfer member provides a wetting enhancement coating on the transfer member. The wetting enhancement coating includes water; binders selected from the group consisting of acrylic polymers, styrene acrylic polymers, vinyl-acrylic polymers, vinyl acetate ethylene; and a surfactant. The printer includes a print head adjacent the transfer member that ejects ink droplets onto a film formed from the wetting enhancement coating to form ink images on the wetting enhancement coating. The printer includes a transfixing station located adjacent the transfer member and downstream from the print head, the transfixing station has a transfixing roll that forms a transfixing nip with the transfer member. The printer includes a transporting device for delivering a recording medium to the transfixing nip wherein the ink image and wetting enhancement coating are transferred to the recording medium.

Described herein is an ink jet printer that includes a transfer member. A wetting enhancement station adjacent the transfer member provides a wetting enhancement coating on the transfer member. The wetting enhancement coating includes water; binders selected from the group consisting of acrylic polymers, styrene acrylic polymers, vinyl-acrylic polymers, vinyl acetate ethylene; and a surfactant. The binders are at a loading of from about 10 weight percent to about 60 weight percent of the wetting enhancement coating. The printer includes a print head adjacent the transfer member that ejects ink droplets onto a film formed from the wetting enhancement coating to form ink images on the wetting enhancement coating. The printer includes a transfixing station located adjacent the transfer member and downstream from the print head, the transfixing station has a transfixing roll that forms a transfixing nip with the transfer member. The printer includes a transporting device for delivering a recording medium to the transfixing nip wherein the ink image and the film are transferred to the recording medium.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate several embodiments of the present teachings and together with the description, serve to explain the principles of the present teachings.

FIG. **1** is a schematic diagram illustrating an aqueous ink image printer.

FIG. **2** shows a silicone intermediate transfer member having an ink jet image applied to the surface.

FIG. **3** shows a silicone intermediate transfer member having an wetting enhancement coating applied to the surface and an ink jet image applied to the wetting enhancement coating.

It should be noted that some details of the figures have been simplified and are drawn to facilitate understanding of the embodiments rather than to maintain strict structural accuracy, detail, and scale.

DESCRIPTION OF THE EMBODIMENTS

Reference will now be made in detail to embodiments of the present teachings, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

In the following description, reference is made to the accompanying drawings that form a part thereof, and in which is shown by way of illustration specific exemplary embodiments in which the present teachings may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the present teachings and it is to be understood that other embodiments may be utilized and that changes may be made without departing from the scope of the present teachings. The following description is, therefore, merely exemplary.

Illustrations with respect to one or more implementations, alterations and/or modifications can be made to the illustrated examples without departing from the spirit and scope of the appended claims. In addition, while a particular feature may have been disclosed with respect to only one of several implementations, such feature may be combined with one or more other features of the other implementations as may be desired and advantageous for any given or particular function. Furthermore, to the extent that the terms “including”, “includes”, “having”, “has”, “with”, or variants thereof are used in either the detailed description and the claims, such terms are intended to be inclusive in a manner similar to the term “comprising.” The term “at least one of” is used to mean one or more of the listed items can be selected.

Notwithstanding that the numerical ranges and parameters setting forth the broad scope of embodiments are approximations, the numerical values set forth in the specific examples are reported as precisely as possible. Any numerical value, however, inherently contains certain errors necessarily resulting from the standard deviation found in their respective testing measurements. Moreover, all ranges disclosed herein are to be understood to encompass any and all sub-ranges subsumed therein. For example, a range of “less than 10” can include any and all sub-ranges between (and including) the minimum value of zero and the maximum value of 10, that is, any and all sub-ranges having a minimum value of equal to or greater than zero and a maximum value of equal to or less than 10, e.g., 1 to 5. In certain cases, the numerical values as stated for the parameter can take on negative values. In this case, the example value of range stated as “less than 10” can assume negative values, e.g. −1, −2, −3, −10, −20, −30, etc.

FIG. **1** illustrates a high-speed aqueous ink image producing machine or printer **10**. As illustrated, the printer **10** is an indirect printer that forms an ink image on a surface of a transfer member **12**, (also referred to as a blanket or receiving member or image member) and then transfers the ink image to media passing through a nip **18** formed with the transfer member **12**. The printer **10** includes a frame **11** that supports directly or indirectly operating subsystems and components, which are described below. The printer **10** includes the transfer member **12** that is shown in the form of a drum, but can also be configured as a supported endless belt. The transfer member **12** has an outer surface **21**. The outer surface **21** is movable in a direction **16**, and on which ink images are formed. A transfix roller **19** rotatable in the direction **17** is loaded against the surface **21** of transfer member **12** to form a transfix nip **18**, within which ink images formed on the surface **21** are transfixed onto a media sheet **49**.

The transfer member **12** can be of any suitable configuration. Examples of suitable configurations include a sheet, a film, a web, a foil, a strip, a coil, a cylinder, a drum, an endless strip, a circular disc, a drelt (a cross between a drum and a belt), a belt including an endless belt, an endless seamed flexible belt, and an endless seamed flexible imaging belt. The transfer member **12** can be a single layer or multiple layers.

The transfer member **12** in the transfix process has to have a conformability which is measured by Shore A durometer. The conformability improves transfer of the aqueous ink images. Typically, the Shore A durometer is form about 20 to about 70, or from about 25 to about 60 or from about 30 to about 50.

The surface **21** of transfer member **12** is formed of a material having a relatively low surface energy to facilitate transfer of the ink image from the surface **21** to the media sheet **49** in the nip **18**. Such materials include silicone, fluorosilicone, fluoroelastomers such as Viton®. Low energy surfaces, however, do not aid in the formation of good quality ink images as they do not spread ink drops as well as high energy surfaces. Disclosed in more detail below is a method and apparatus that improves the spreading ability of the ink to provide good ink images while allowing for proper release of the ink images onto the recording substrate **49**.

Continuing with the general description, the printer **10** includes an optical sensor **94**A, also known as an image-on-drum (“IOD”) sensor, that is configured to detect light reflected from the surface **21** of the transfer member **12** and the coating applied to the surface **21** as the member **12** rotates past the sensor. The optical sensor **94**A includes a linear array of individual optical detectors that are arranged in the cross-process direction across the surface **21** of the transfer member **12**. The optical sensor **94**A generates digital image data corresponding to light that is reflected from the surface **21**. The optical sensor **94**A generates a series of rows of image data, which are referred to as “scanlines,” as the transfer member **12** rotates in the direction **16** past the optical sensor **94**A. In one embodiment, each optical detector in the optical sensor **94**A further comprises three sensing elements that are sensitive to frequencies of light corresponding to red, green, and blue (RGB) reflected light colors. The optical sensor **94**A also includes illumination sources that shine red, green, and blue light onto the surface **21**. The optical sensor **94**A shines complementary colors of light onto the image receiving surface to enable detection of different ink colors using the RGB elements in each of the photodetectors. The image data generated by the optical sensor **94**A is analyzed by the controller **80** or other processor in the printer **10** to identify the thickness of ink image and wetting enhancement coating (explained in more detail below) on the surface **21** and the area coverage. The thickness and coverage can be identified from either specular or diffuse light reflection from the blanket surface and coating. Other optical sensors, such as **94**B, **94**C, and **94**D, are similarly configured and can be located in different locations around the surface **21** to identify and evaluate other parameters in the printing process, such as missing or inoperative inkjets and ink image formation prior to image drying (**94**B), ink image treatment for image transfer (**94**C), and the efficiency of the ink image transfer (**94**D). Alternatively, some embodiments can include an optical sensor to generate additional data that can be used for evaluation of the image quality on the media (**94**E).

The printer **10** also can include a surface energy applicator **120** positioned next to the surface **21** of the transfer member

12 at a position immediately prior to the surface **21** entering the print zone formed by printhead modules **34**A-**34**D. The surface energy applicator **120** can be, for example, a corotron, a scorotron, or a biased charge roller. The surface energy applicator **120** is configured to emit an electric field between the applicator **120** and the surface **21** that is sufficient to ionize the air between the two structures and apply negatively charged particles, positively charged particles, or a combination of positively and negatively charged particles to the surface **21**. The electric field and charged particles increase the surface energy of the blanket surface and coating. The increased surface energy of the surface **21** enables the ink drops subsequently ejected by the printheads in the modules **34**A-**34**D to adhere to the surface **21** and coalesce.

The printer **10** includes an airflow management system **100**, which generates and controls a flow of air through the print zone. The airflow management system **100** includes a printhead air supply **104** and a printhead air return **108**. The printhead air supply **104** and return **108** are operatively connected to the controller **80** or some other processor in the printer **10** to enable the controller to manage the air flowing through the print zone. This regulation of the air flow helps prevent evaporated solvents and water in the ink from condensing on the printhead and helps attenuate heat in the print zone to reduce the likelihood that ink dries in the inkjets, which can clog the inkjets. The airflow management system **100** can also include sensors to detect humidity and temperature in the print zone to enable more precise control of the air supply **104** and return **108** to ensure optimum conditions within the print zone. Controller **80** or some other processor in the printer **10** can also enable control of the system **100** with reference to ink coverage in an image area or even to time the operation of the system **100** so air only flows through the print zone when an image is not being printed.

The high-speed aqueous ink printer **10** also includes an aqueous ink supply and delivery subsystem **20** that has at least one source **22** of one color of aqueous ink. Since the illustrated printer **10** is a multicolor image producing machine, the ink delivery system **20** includes four (4) sources **22**, **24**, **26**, **28**, representing four (4) different colors CYMK (cyan, yellow, magenta, black) of aqueous inks. In the embodiment of FIG. **1**, the printhead system **30** includes a printhead support **32**, which provides support for a plurality of printhead modules, also known as print box units, **34**A through **34**D. Each printhead module **34**A-**34**D effectively extends across the width of the intermediate transfer member **12** and ejects ink drops onto the surface **21**. A printhead module can include a single printhead or a plurality of printheads configured in a staggered arrangement. Each printhead module is operatively connected to a frame (not shown) and aligned to eject the ink drops to form an ink image on the surface **21**. The printhead modules **34**A-**34**D can include associated electronics, ink reservoirs, and ink conduits to supply ink to the one or more printheads. In the illustrated embodiment, conduits (not shown) operatively connect the sources **22**, **24**, **26**, and **28** to the printhead modules **34**A-**34**D to provide a supply of ink to the one or more printheads in the modules. As is generally familiar, each of the one or more printheads in a printhead module can eject a single color of ink. In other embodiments, the printheads can be configured to eject two or more colors of ink. For example, printheads in modules **34**A and **34**B can eject cyan and magenta ink, while printheads in modules **34**C and **34**D can eject yellow and black ink. The printheads in the illustrated modules are arranged in two arrays that are offset, or staggered, with respect to one another to increase the resolution of each color separation printed by a module. Such an arrangement enables printing at twice the resolution of a printing system only having a single array of printheads that eject only one color of ink. Although the printer **10** includes four printhead modules **34**A-**34**D, each of which has two arrays of printheads, alternative configurations include a different number of printhead modules or arrays within a module.

After the printed image on the surface **21** exits the print zone, the image passes under an image dryer **130**. The image dryer **130** includes an infrared heater **134**, a heated air source **136**, and air returns **138**A and **138**B. The infrared heater **134** applies infrared heat to the printed image on the surface **21** of the transfer member **12** to evaporate water or solvent in the ink. The heated air source **136** directs heated air over the ink to supplement the evaporation of the water or solvent from the ink. The air is then collected and evacuated by air returns **138**A and **138**B to reduce the interference of the air flow with other components in the printing area.

As further shown, the printer **10** includes a recording media supply and handling system **40** that stores, for example, one or more stacks of paper media sheets of various sizes. The recording media supply and handling system **40**, for example, includes sheet or substrate supply sources **42**, **44**, **46**, and **48**. In the embodiment of printer **10**, the supply source **48** is a high capacity paper supply or feeder for storing and supplying image receiving substrates in the form of cut media sheets **49**, for example. The recording media supply and handling system **40** also includes a substrate handling and transport system **50** that has a media pre-conditioner assembly **52** and a media post-conditioner assembly **54**. The printer **10** includes an optional fusing device **60** to apply additional heat and pressure to the print medium after the print medium passes through the transfix nip **18**. In one embodiment, the fusing device **60** adjusts a gloss level of the printed images that are formed on the print medium. In the embodiment of FIG. **1**, the printer **10** includes an original document feeder **70** that has a document holding tray **72**, document sheet feeding and retrieval devices **74**, and a document exposure and scanning system **76**.

Operation and control of the various subsystems, components and functions of the machine or printer **10** are performed with the aid of a controller or electronic subsystem (ESS) **80**. The ESS or controller **80** is operably connected to the image receiving member **12**, the printhead modules **34**A-**34**D (and thus the printheads), the substrate supply and handling system **40**, the substrate handling and transport system **50**, and, in some embodiments, the one or more optical sensors **94**A-**94**E. The ESS or controller **80**, for example, is a self-contained, dedicated mini-computer having a central processor unit (CPU) **82** with electronic storage **84**, and a display or user interface (UI) **86**. The ESS or controller **80**, for example, includes a sensor input and control circuit **88** as well as a pixel placement and control circuit **89**. In addition, the CPU **82** reads, captures, prepares and manages the image data flow between image input sources, such as the scanning system **76**, or an online or a work station connection **90**, and the printhead modules **34**A-**34**D. As such, the ESS or controller **80** is the main multi-tasking processor for operating and controlling all of the other machine subsystems and functions, including the printing process discussed below.

The controller **80** can be implemented with general or specialized programmable processors that execute programmed instructions. The instructions and data required to perform the programmed functions can be stored in memory associated with the processors or controllers. The processors, their memories, and interface circuitry configure the controllers to perform the operations described below. These components can be provided on a printed circuit card or provided as a circuit in an application specific integrated circuit (ASIC). Each of the circuits can be implemented with a separate processor or multiple circuits can be implemented on the same processor. Alternatively, the circuits can be implemented with discrete components or circuits provided in very large scale integrated (VLSI) circuits. Also, the circuits described herein can be implemented with a combination of processors, ASICs, discrete components, or VLSI circuits.

In operation, image data for an image to be produced are sent to the controller **80** from either the scanning system **76** or via the online or work station connection **90** for processing and generation of the printhead control signals output to the printhead modules **34**A-**34**D. Additionally, the controller **80** determines and/or accepts related subsystem and component controls, for example, from operator inputs via the user interface **86**, and accordingly executes such controls. As a result, aqueous ink for appropriate colors are delivered to the printhead modules **34**A-**34**D. Additionally, pixel placement control is exercised relative to the surface **21** to form ink images corresponding to the image data, and the media, which can be in the form of media sheets **49**, are supplied by any one of the sources **42**, **44**, **46**, **48** and handled by recording media transport system **50** for timed delivery to the nip **18**. In the nip **18**, the ink image is transferred from the surface **21** of the transfer member **12** to the media substrate within the transfix nip **18**.

In some printing operations, a single ink image can cover the entire surface **21** (single pitch) or a plurality of ink images can be deposited on the surface **21** (multi-pitch). In a multi-pitch printing architecture, the surface **21** of the transfer member **12** (also referred to as image receiving member) can be partitioned into multiple segments, each segment including a full page image in a document zone (i.e., a single pitch) and inter-document zones that separate multiple pitches formed on the surface **21**. For example, a two pitch image receiving member includes two document zones that are separated by two inter-document zones around the circumference of the surface **21**. Likewise, for example, a four pitch image receiving member includes four document zones, each corresponding to an ink image formed on a single media sheet, during a pass or revolution of the surface **21**.

Once an image or images have been formed on the surface under control of the controller **80**, the illustrated inkjet printer **10** operates components within the printer to perform a process for transferring and fixing the image or images from the surface **21** to media. In the printer **10**, the controller **80** operates actuators to drive one or more of the rollers **64** in the media transport system **50** to move the media sheet **49** in the process direction P to a position adjacent the transfix roller **19** and then through the transfix nip **18** between the transfix roller **19** and the surface **21** of transfer member **12**. The transfix roller **19** applies pressure against the back side of the recording media **49** in order to press the front side of the recording media **49** against the surface **21** of the transfer member **12**. Although the transfix roller **19** can also be heated, in the embodiment of FIG. **1**, the transfix roller **19** is unheated. Instead, the pre-heater assembly **52** for the media sheet **49** is provided in the media path leading to the nip. The pre-conditioner assembly **52** conditions the media sheet **49** to a predetermined temperature that aids in the transferring of the image to the media, thus simplifying the design of the transfix roller. The pressure produced by the transfix roller **19** on the back side of the heated media sheet **49** facilitates the transfixing (transfer and fusing) of the image from the transfer member **12** onto the media sheet **49**.

The rotation or rolling of both the transfer member **12** and transfix roller **19** not only transfixes the images onto the media sheet **49**, but also assists in transporting the media sheet **49** through the nip. The transfer member **12** continues to rotate to continue the transfix process for the images previously applied to the coating and blanket **21**.

As shown and described above the transfer member **12** or image receiving member initially receives the ink jet image. After ink drying, the transfer member **12** releases the image to the final print substrate during a transfer step in the nip **18**. The transfer step is improved when the surface **21** of the transfer member **12** has a relatively low surface energy. However, a surface **21** with low surface energy works against the desired initial ink wetting (spreading) on the transfer member **12**. Unfortunately, there are two conflicting requirements of the surface **21** of transfer member **12**. The first aims for the surface to have high surface energy causing the ink to spread and wet (i.e. not bead-up). The second requirement is that the ink image once dried has minimal attraction to the surface **21** of transfer member **12** so as to achieve maximum transfer efficiency (target is 100%), this is best achieved by minimizing the surface **21** surface energy.

To be more specific, the transfer member **12** materials that release the best are among the classes of silicone, fluorosilicone, and fluoroelastomers such as Viton®. They all have low surface energy but provide poor ink wetting. Alternatively, polyurethane and polyimide, may wet very well but do not give up the ink easily.

By providing a wetting enhancement coating (WEC) and drying the coating to form a higher surface energy coating on the surface **21** of the transfer member **12**, improved wetting of the ink image on the transfer member **12** is obtained. The ink image is applied to the wetting enhancement coating film. The dried film is incompatible with the ink and/or is thick enough to avoid the coating being re-dissolved into the ink.

Returning to FIG. **1**, a surface maintenance unit (SMU) **92** include a coating station such as coating applicator, a metering blade, and, in some embodiments, a cleaning blade. The coating applicator can further include a reservoir having a fixed volume of wetting enhancement fluid and a resilient donor member, which can be smooth or porous and is mounted in the reservoir for contact with the wetting enhancement coating material and the metering blade. The wetting enhancement coating is applied to the surface **21** of transfer member **12** to form a thin layer on the surface **21**. The SMU **92** is operatively connected to a controller **80**, to enable the controller to operate the donor member, metering blade and cleaning blade selectively to deposit and distribute the coating material onto the surface **21** of transfer member **12**. The SMU **92** can include a dryer positioned between the coating station and the print head to increase to film formation of the wetting enhancement coating.

After transfer, the WEC and ink are fixed to the recording media **49** with the WEC acting as a protective image overcoat. Another advantage of the WEC is that it eliminates potential life issues associated with the transfer member **12** after many paper touches since the WEC always “refreshes” the surface **21** of the transfer member **12** after each print cycle.

The sacrificial Wetting Enhancement Coating (WEC) is described. The aqueous (WEC) fluid coating is applied to the surface **21** where it dries to form a solid film. The coating will have a higher surface energy and/or be more hydrophilic than the surface **21** of transfer member **12**. In addition, the coating does not re-dissolve in the ink before the ink droplets dry. To achieve this goal, cross-linking or partial crosslinking is introduced during the drying of the WEC.

In embodiments, the WEC is an aqueous latex-acrylic dispersion; the WEC coalesces at an ambient temperature to form a continuous film. Components of the WEC include water, a binder polymer and a surfactant. The binder is selected from the group consisting of acrylic polymers, styrene acrylic polymers, vinyl-acrylic polymers and vinyl acetate ethylene. The weight percentage of any binder can be from 10 to 60 weight percent depending upon the WEC property desired. The surfactant is a water soluble siloxane. The binders do not dissolve in water and therefore the WEC is not a solution. Because the binders are in the form of an emulsion suspended in water, the coating fluid has a low viscosity at high concentrations of binder. The low viscosity produces a thin layer which is advantageous for being easy to coat, and spreading to form a thin layer. A thin layer at high concentration of binder reduces the drying required to transform the coating to a solid. Energy is saved and speed of the printer is increased.

The concentration of the binders in the WEC ranges from about 10 weight percent to about 60 weight percent, or in embodiments from about 20 weight percent to about 60 weight percent or from about 30 weight percent to about 60 weight percent. In contrast a solution coating has a maximum of 10 weight percent solids to form a layer and is typically much lower.

The WEC solidifies through emulsion polymerization wherein the binders crosslink forming an impermeable surface. The polymers or binders coalesce to form a durable coating that has a thickness of from about 0.1 micron to about 2 microns, or from about 0.1 microns to about 1.0 microns or from about 0.2 microns to about 0.7 microns. The wetting enhancement coating has a higher surface energy than the surface **21** of the transfer member **12**. In embodiments, the surface energy of the wetting enhancement coating after drying is greater than about 25 mJ/m^2, or greater than about 28 mJ/m^2 or greater than about 30 mJ/m^2.

The surfactant in the wetting enhancement coating can be an aqueous soluble polysiloxane copolymer to enhance or smooth the coating. The concentration of the surfactant in the WEC is from about 0.1 weight percent to about 2 weight percent, or from about 0.2 weight percent to about 1 or from about 0.25 weight percent to about 0.75 weight percent. The surfactant can be a polysiloxane copolymer that includes a polyester modified polydimethylsiloxane, commercially available from BYK Chemical with the trade name of BYK® 310 (about 25 weight percent in xylene) and 370 (about 25 weight percent in xylene/alkylbenzenes/cyclohexanone/monophenylglycol=75/11/7/7); a polyether modified polydimethylsiloxane, commercially available from BYK Chemical with the trade name of BYK® 330 (about 51 weight percent in methoxypropylacetate) and 344 (about 52.3 weight percent in xylene/isobutanol=80/20), BYK®-SILCLEAN 3710 and 3720 (about 25 weight percent in methoxypropanol); a polyacrylate modified polydimethylsiloxane, commercially available from BYK Chemical with the trade name of BYK®-SILCLEAN 3700 (about 25 weight percent in methoxypropylacetate); or a polyester polyether modified polydimethylsiloxane, commercially available from BYK Chemical with the trade name of BYK® 375 (about 25 weight percent in Di-propylene glycol monomethyl ether). The surfactant can be a low molecular weight ethoxylated polydimethylsiloxane with the trade name Silsurf® A008 available from Siltech Corporation.

Specific embodiments will now be described in detail. These examples are intended to be illustrative, and not limited to the materials, conditions, or process parameters set forth in these embodiments. All parts are percentages by solid weight unless otherwise indicated.

EXAMPLES

Water based latex clear coating from Home Depot which contains acrylic resins was obtained and diluted by one quarter. SilSurf A008 was used as surfactant to enable the water based paint to wet the silicone plate. An anilox roll was used to coat an approximately 5 micron fluid layer. The fluid layer was dried to form an approximately 0.5 micron film.

Jetting experiments were conducted and show a dramatic improvement in wetting and image quality as described in more detail below. The transfer to paper at about 110° C. was nearly 100 percent.

FIG. **2** shows a silicone ITM with various ink jet shapes applied onto the surface. FIG. **3** shows a silicone ITM having the fluid layer described above applied on the surface of the silicone ITM. The same ink jet shapes were applied to the surface of the ITM having a dried WEC as shown in FIG. **3**. As can clearly be seen in the comparison between FIGS. **2** and **3**, the wetting enhancement coating provides ink jet shapes that do not bead.

It will be appreciated that variants of the above-disclosed and other features and functions or alternatives thereof, may be combined into other different systems or applications. Various presently unforeseen or unanticipated alternatives, modifications, variations, or improvements therein may be subsequently made by those skilled in the art which are also encompassed by the following claims.

What is claimed is:

1. A method for ink jet printing comprising:

providing a wetting enhancement coating on a transfer member, wherein the wetting enhancement coating comprises; water; non-water soluble binders; and a surfactant;

drying the wetting enhancement coating to form a film having a surface energy greater than 25 mJ/m^2;

ejecting ink droplets to form an ink image on the film;

drying the ink image on the film; and

transferring the inkjet image and the film onto a recording medium.

2. The method of claim **1**, wherein the non-water soluble binders are selected from the group consisting of acrylic polymers, styrene acrylic polymers, vinyl-acrylic polymers, vinyl acetate ethylene polymers.

3. The method of claim **1**, wherein the non-water soluble binders are dispersed in water in a form of emulsion.

4. The method of claim **1**, wherein the non-water soluble binders comprise from about 10 weight percent to about 6.0 weight percent of the wetting enhancement coating.

5. The method of claim **1**, wherein the surfactant comprises an aqueous soluble siloxane.

6. The method of claim **1**, wherein the surfactant comprises from about 0.1 weight percent to about 2.0 weight percent of the wetting enhancement coating.

7. The method of claim **1**, wherein the film has a thickness from about 0.1 microns to about 2 microns.

8. The method of claim **1**, wherein the surface energy greater than 28 mJ/m^2.

9. An ink jet printer comprising: a transfer member; a wetting enhancement station adjacent said transfer member that provides a wetting enhancement coating on the transfer member wherein the wetting enhancement coating comprises; water; non-water soluble binders selected from the group consisting of acrylic polymers, styrene acrylic polymers, vinyl-acrylic polymers, vinyl acetate ethylene; and a surfactant; a print head adjacent said transfer member that ejects aqueous ink droplets onto a film formed from wetting enhancement coating on the transfer member to form ink images on the wetting enhancement coating; a transfixing station located adjacent said transfer member and downstream from said print head, the transfixing station having a transfixing roll forming a transfixing nip therewith at said transfixing station; a transporting device for delivering a recording medium to the transfixing nip wherein the ink image and film are transferred to the recording medium.

10. The ink jet printer of claim **9**, wherein the non-water soluble binders comprise from about 10 weight percent to about 60 weight percent of the wetting enhancement coating.

11. The ink jet printer of claim **9**, wherein the surfactant comprises soluble siloxane at a loading of from about 0.1 weight percent to about 1.0 weight percent of the wetting enhancement coating.

12. The ink jet printer of claim **9**, wherein the film is not dissolvable by the aqueous ink droplets.

13. The ink jet printer of claim **9**, wherein the film has a thickness from about 0.1 microns to about 2 microns.

14. The ink jet printer of claim **9**, further comprising a dryer positioned between the wetting enhancement station and the print head.

15. An ink jet printer comprising: a transfer member; a wetting enhancement station adjacent said transfer member that provides a wetting enhancement coating on the transfer member wherein the wetting enhancement coating comprises; water; non-water soluble binders selected from the group consisting of acrylic polymers, styrene acrylic polymers, vinyl-acrylic polymers, vinyl acetate ethylene at a loading of from about 10 weight percent to about 60 weight

percent of the wetting enhancement coating; and a surfactant; a print head adjacent said transfer member that ejects ink droplets onto a film formed from the wetting enhancement coating on the transfer member to form ink images on the wetting enhancement coating; a transfixing station located adjacent said transfer member and downstream from said print head, the transfixing station having a transfixing roll forming a transfixing nip therewith at said transfixing station; a transporting device for delivering a recording medium to the transfixing nip wherein the ink image and wetting enhancement coating are transferred to the recording medium.

16. The ink jet printer of claim **15**, wherein the surfactant comprises soluble siloxane at a loading of from about 0.1 weight percent to about 2.0 weight percent of the wetting enhancement coating.

17. The ink jet printer of claim **15**, wherein the film is not dissolvable by the ink droplets.

18. The ink jet printer of claim **15**, wherein the film has a thickness from about 0.1 microns to about 2 microns.

19. The ink jet printer of claim **15**, further comprising a dryer positioned between the wetting enhancement station and the print head.

20. The ink jet printer of claim **15**, wherein the film has a surface energy greater than 25 mJ/m^2.

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